BIOTIC COMMUNITIES

The East Osage River Basin hosts a diverse biotic community including many aquatic species. Fauna was first categorized, recorded, and named as early explorers moved up into the basin and into surrounding areas. Over time many of the earlier records of certain faunal collections have become obscure or unobtainable. This is unfortunate as these records were some of the only means to accurately describe the regions faunal composition prior to and during the early days of settlement.

Since settlement of the basin by European settlers and their descendants, numerous changes to the habitat have prompted coinciding shifts in aquatic as well as terrestrial fauna. As the backwater areas were drained to be used as farmland, steep slopes were plowed for crop production, and the timber harvested for various uses, many of the species which depended on these habitats either persisted as best as they could or dropped out of the picture all together. Bison, elk, wolves, mountain lions, and passenger pigeons are just a few of the more spectacular species which could not cope with the habitat changes and/or hunting pressure brought about by European settlement and disappeared from the basin entirely. Numerous species have persisted although in reduced numbers. Sturgeon were once plentiful in the Osage Riveras were paddlefish and walleye.

Smaller fishes such as the Niangua darter presently have their existence in peril due to degraded water quality and their inability to replenish depleted populations due to impoundment of the larger reaches of streams and rivers which they once used as dispersal corridors (Pflieger 1997). Numerous freshwater mussel species are similarly in jeopardy due to overharvest, degradation of habitat from gravel dredging and siltation, manipulation of river levels and temperature regime by dams, and competition with exotic species.

Despite the human-induced impacts to the fauna of the region, high species diversity and population levels persist for those species which have adapted well to the changes. Populations of sportfish and game animals provide ample recreational opportunities. The Missouri Department of Conservation regulates the taking and possessing of Missouri fauna.

MDC Fish Community Samples

Fish community data of the basin were first recorded and archived by MDC in the 1930s. Since that time, numerous population monitoring efforts have resulted in a substantial database of fish community samples. The species composition of the more abundant gamefish, large non-game fish, and small non-game fish per subbasin is presented below (Table 17). For ease of discussion, the periods of fish community collections by MDC have been separated into four distinct time periods: Period A (prior to 1946), Period B (1946-1973), Period C (1974-1990), and Period D (1991-2001)(Tables 18, 19, 20, 21). By comparing the four time periods, shifts in fish community structure can be more easily discerned.

Fish communities have been sampled in the basin by MDC using kick seines, drag seines, electrofishing equipment with DC current, rotenone, and visual observation (Table 22). There have been a total of 178

fish community samples collected by MDC within the basin. These samples represent 113 unique sampling locations (Figure 19). A total of 131,154 fish make up the samples basin-wide with 102 species represented. The fish community samples of each subbasin are described below. The early fish collections were made by W. Pflieger. More recent fish collections have been made by M.. Bayless, S. Bruenderman, T. Groshens, H.. Mattingly, M.. Smith, M.. Boyer, and M.. Winston.

Cole Camp Creek Subbasin Fish Community Samples

Within this subbasin, MDC has made 10 samples representing five unique sites. One sample was taken in 1940. Two samples were taken in 1962. Two samples were taken in 1976 and the remainder were taken after 1994. All samples were taken using seining equipment with one sample supplemented with visual observations. Six thousand and fifty-four fish make up the samples of this subbasin, representing forty-five species.

The most abundant game fishes captured within the subbasin were green sunfish (1.5%), longear sunfish (0.99%), bluegill (0.76%), and largemouth bass (0.45%). The most abundant large non-game fish species captured within the basin were the golden redhorse (0.38%) and black redhorse (0.28%). The most abundant small non-game fish species present in the samples were Ozark minnow (38.0%), bleeding shiner (9.4%), northern orangethroated darter (8.8%), and brook silverside (6.4%). There was a higher percentage of Ozark minnows and orangethroat darters collected in the Cole Camp Creek Subbasin than in any other subbasin.

The least abundant fish species captured within this subbasin were banded darter, banded sculpin, channel catfish, common carp, freshwater drum, gizzard shad, and hornyhead chub with only one specimen each of these species present within the samples. The species which have not been collected by MDC during fish community sampling efforts within this subbasin since 1940 include: gizzard shad, red shiner, hornyhead chub, suckermouth minnow, channel catfish, river carpsucker, and banded darter. The orangespotted sunfish has not been collected since 1962. The banded sculpin has not been collected since 1976. Fish species of conservation concern present within this subbasin include plains topminnow and least darter.

Upper Lake of the Ozarks Hills Subbasin Fish Community Samples

Within this subbasin, MDC has made 10 fish community samples representing seven unique sites. Three samples were taken using electrofishing equipment. One was taken in 1964 and two were taken in 1976. Samples using seining equipment were taken in the following years: one in 1940, one in 1976, one in 1979, and four in 1995. Three thousand eight hundred and fifty fish make up the samples of this subbasin representing twenty-nine species.

The most abundant game fishes captured within the subbasin were green sunfish (13.2%), smallmouth bass (9.9%), and bluegill (5.3%). The most abundant small non-game fish species present in the samples were bleeding shiner (20.2%), central and largescale stonerollers (8.1%), creek chub (7.9%), and southern redbelly dace (6.8%). There was a greater percentage of green sunfish, creek chubs, smallmouth bass, yellow bullheads, and northern hogsucker collected in this subbasin than in any other.

The least abundant fish species captured within this subbasin were banded sculpin, channel catfish, longear sunfish, Ozark sculpin, spotted bass, and stippled darter with only one specimen each of these species present within the samples. The species which have not been collected by MDC during fish community sampling efforts within this subbasin since 1964 include channel catfish and longear sunfish. The hornyhead chub, yellow bullhead, and largemouth bass has not been present in MDC fish community samples in this subbasin since the 1970's.

Gravois Arm Subbasin Fish Community Samples

Within this subbasin, MDC collected six samples representing four unique sites. Three samples were taken in 1940. One sample was taken in each of the years 1996, 1999, and 2000. All samples of this subbasin were taken using seining equipment with one sample supplemented with visual observations. One thousand and ten fish, representing 35 species, comprise the samples collected within this subbasin.

The most abundant game fishes represented within the samples of this subbasin were longear sunfish (5%), largemouth bass (3%), and smallmouth bass (2.2%). The only large non-game fish species present was northern hogsucker (1.3%). The most abundant small non-game fish species present were bleeding shiner (25%), northern studfish (14.6%), and Ozark minnow (11.3%). There was a greater percentage of largemouth bass and northern studfish collected in the Gravois Arm than in any other subbasin.

The least abundant fish species captured within this subbasin were banded sculpin, brook silverside, fathead minnow, golden shiner, greenside darter, least darter, Ozark sculpin, plains topminnow, sand shiner, southern redbelly dace, spotted bass, and yellow bullhead with only one specimen each of these species present within the samples. Since 1940 gizzard shad, red shiner, sand shiner, fathead minnow, blackspotted topminnow, brook silverside, banded sculpin, greenside darter, least darter, and stippled darter have not been collected by MDC. Species of conservation concern present within this subbasin include plains topminnow and least darter.

Miller County Osage River Hills Subbasin Fish Community Samples

Within this subbasin, MDC collected 24 samples representing 15 unique sites. One sample was taken in 1937, three in 1940, eight in the mid-70s, and seven samples have been collected since 1994. All samples of this subbasin were taken using seining equipment with three samples supplemented with visual observations. Thirty-three thousand, two hundred and twenty-seven fish make up the samples of this subbasin. This is the most diverse subbasin in the basin with eighty-nine species represented.

The most abundant gamefishes were bluegill (5.5%), longear sunfish (1.5%), channel catfish (1.3%), spotted bass (0.6%), and white crappie (0.5%). The most abundant large non-game fish species present were river carpsucker (1.5%), longnose gar (1%), common carp (0.32%), and smallmouth buffalo (0.31%). The most abundant small non-game fish species present were emerald shiner (17%) and gravel chub (14.1%). White crappie dominated this and the Dry Auglaize Creek samples. A higher percentage of bluegill, spotted bass, channel catfish, river carpsuckers, longnose gar, gravel chubs, emerald shiners, bluntnose minnows, and brook silversides were collected in the Miller County Osage River Hills than in any other basin.

The black bullhead, greenside darter, lake sturgeon, northern pike, orangespotted sunfish, river redhorse,

shovelnose sturgeon, speckled chub, and the striped shiner were the least abundant species captured with only one specimen of each of these species collected. Since 1940, the lake sturgeon, suckermouth minnow, and orangespotted sunfish have not been collected by MDC. An additional thirty-eight fish species have not been collected in this subbasin since the mid-70s (Table 25). However, no fish community samples have been collected from the Osage River in this subbasin since that time period. Species of conservation concern present within this subbasin include the plains topminnow, lake sturgeon, blue sucker, paddlefish, ghost shiner, highfin carpsucker, and least darter.

Lower Osage River Subbasin Fish Community Samples

Within this subbasin, MDC has collected nine samples representing six unique sites. Seining was used as the method of capture during 1940, 1962, 1963, 1976, and 1996. Two seining samples also were supplemented with visual observations. Two additional samples were taken in 1962 and 1963. In the 1962 sample, seining, shocking, and cyanide were used as methods of capture. In the 1963 sample, only electrofishing was used. Six thousand one hundred and one fish make up the samples of this subbasin.

The most abundant game fishes represented within the samples of this subbasin were bluegill (4.6%), longear sunfish (3.1%), and spotted bass (1.4%). The most abundant large non-game fish species present were shorthead redhorse (0.8%) and black redhorse (0.7%). The most abundant small non-game fish species present in the samples were Ozark minnow (29.9%) and bleeding shiner (15.5%). This subbasin had a greater percentage of shorthead redhorse collected than any other subbasin.

The least abundant fish species captured within this subbasin were black crappie, flathead catfish, greenside darter, mottled sculpin, northern pike, sauger, shortnose gar, silver chub, silver redhorse, silverband shiner, slenderhead darter, and smallmouth buffalo with only one specimen of each of these species present within the samples. The redfin shiner has not been collected by MDC during fish community sampling efforts within this subbasin since 1940. An additional ten fish species have not been collected in this subbasin since 1963 (Table 25) because there have been no fish community samples taken from this subbasin since then. Species of conservation concern captured within this subbasin include plains topminnow, western silvery minnow, silver chub, ghost shiner, and Alabama shad.

Lower Maries River Subbasin Fish Community Samples

Within this subbasin, MDC has made 12 samples at six sites. Seining was used only during 1940, 1964, 1976, and 1996. Samples using only visual observations were taken in 1975 and 1996. In 1994, an additional sample was taken using seining and electrofishing. Seven thousand eight hundred and seventy-seven fish were sampled in this subbasin.

The most abundant game fishes sampled in this subbasin were longear sunfish (4.0%), bluegill (1.1%), spotted bass (0.51%), and smallmouth bass (0.5%). The most abundant large non-game fish species present were black redhorse (0.7%), common carp (0.5%), and golden redhorse (0.5%). The most abundant small non-game fish species present in the samples were Ozark minnow (22.1%), bleeding shiner (20.4%), wedgespot shiner (9.8%) and striped fantail darter (5.1%). This subbasin had a greater percentage of common carp, golden redhorse, largescale stoneroller, and wedgespot shiner collected than any other subbasin.

The least abundant fish species captured within this subbasin were ghost shiner, johnny darter, orange spotted sunfish, silver redhorse, warmouth, and white bass with only one specimen each of these species present within the samples. The chestnut lamprey has not been collected by MDC during fish community sampling efforts within this subbasin since 1964. Species of conservation concern present within this subbasin include plains topminnow, western silvery minnow, and Niangua darter.

Upper Maries River Subbasin Fish Community Samples

Within this subbasin, MDC has made seven samples representing five unique sites all by seining. Three samples were taken in 1976. One sample was taken in each of the years 1940, 1964, and 1995. Seven thousand two hundred and ninety-nine fish were sampled representing 36 species.

The most abundant game fishes represented in this subbasin were longear sunfish (0.8%), bluegill (0.4%), yellow bullhead (0.3%) and smallmouth bass (0.3%). Only two individual large non-game fishes were captured within this subbasin, a golden redhorse and a black redhorse. This subbasin had a greater percentage of southern redbelly dace captured than any other subbasin. The least abundant fish captured within this subbasin were black redhorse, fathead minnow, golden redhorse, northern pike, red shiner, and wedgespot shiner with only one specimen of each of these species present within the samples. Since 1940, MDC has not collected red shiners, redfin shiners, or wedgespot shiners. Species of conservation concern present within this subbasin include plains topminnow and blacknose shiner.

Little Maries River Subbasin Fish Community Samples

Within this subbasin, MDC collected nine samples at four sites. One sample was taken in 1940 and 1964, four samples in the mid 70's, and three samples were taken in 1995. Seining was the sole sampling method. Five thousand, eight hundred and twelve fish were collected in this subbasin representing thirty-three fish species.

The most abundant game fishes represented were longear sunfish (1.6%), smallmouth bass (1.1%), and bluegill (0.8%). The only species of large non-game fish captured was black redhorse (0.03%) The most abundant small non-game fish species sampled were bleeding shiner (30%), Ozark minnow (13.6%), central stoneroller (10.2%), and striped fantail darter (9.9%). This subbasin had a greater percentage of striped fantail darters collected than any other subbasin.

The least abundant fish species captured within this subbasin were black bullhead, greenside darter, and spotted bass with only one specimen of each of these species present within the samples. The red shiner and redfin shiner have not been collected by MDC during fish community sampling efforts since 1940. Species of conservation concern present within this subbasin include blacknose shiner and plains topminnow.

Tavern Creek Subbasin Fish Community Samples

Within this subbasin, MDC collected 48 samples at 31 unique sites. Four samples were taken in 1940 and four samples in 1964. Twenty-nine samples were taken in the mid-70s and the remainder were taken since 1994. Forty-four samples were taken using seining with visual observations supplementing nine of

these. Four samples were taken by visual observation only. Thirty-four thousand, three hundred and eighty-one fish make up the samples of this subbasin representing sixty-eight species.

The most abundant game fishes represented within the samples of this subbasin were longear sunfish (1.6%), smallmouth bass (1%), and bluegill (0.8%). The most abundant large non-game fish species present were black redhorse (0.4%) and northern hogsucker (0.2%). The most abundant small non-game fish species present in the samples were bleeding shiner (27%) and Ozark minnow (14.8%).

The least abundant fish species captured within this subbasin were common carp, emerald shiner, freckled madtom, mooneye, Ozark sculpin, western silvery minnow, and white bass with only one individual of each of these captured. The mooneye has not been collected by MDC during fish community sampling within this subbasin since 1964. The chestnut lamprey has not been collected since 1975. Species of conservation concern within this subbasin include Niangua darter, plains topminnow, and western silvery minnow.

Wet Glaize Creek Subbasin Fish Community Samples

Within this subbasin, MDC collected 13 samples at 9 unique sites. One sample was taken in 1967 using seining and electrofishing. One sample was taken in 1975 using visual observation only. The remaining samples were taken in the years 1962, 1975, 1998, and 1999 by seining with three of these remaining samples supplemented with visual observations. Six thousand, seven hundred and thirty-seven fish were collected in this subbasin. Fifty-seven species are represented within the samples.

The most abundant game fishes represented within the samples of this subbasin were green sunfish (0.9%) and longear sunfish (0.34%). The most abundant large non-game fish species present was northern hogsucker (0.5%). The most abundant small non-game fish species present in the samples were bleeding shiner (29%), Ozark minnow (12.3%) and fathead minnow (8.8%). This subbasin had a greater percentage of fathead minnows collected than any other subbasin possibly due to the continued incidental introduction of this species into the streams by fish hatcheries in the basin.

The quillback, river carpsucker, and walleye were the least abundant fish species with only one specimen collected. Since 1967, chestnut lamprey, longnose gar, and gizzard shad have not been collected by MDC. However, there have been no collections made with electrofishing in this subbasin since then. There were no species of conservation concern collected within this subbasin.

Dry Auglaize Creek Subbasin Fish Community Samples

Within this subbasin, MDC has collected 24 samples representing 17 sites. One sample was taken in 1931 using a seine. A second sample was taken in 1975 using seine and visual observations. The remaining twenty-two samples were taken 1996-2000 using seines with one of these samples supplemented with visual observations. Sixteen thousand six hundred and ninety-five individuals were collected in this subbasin representing forty-one species.

The most abundant game fishes represented within the samples of this subbasin were green sunfish (2.5%) and bluegill (2.3%). The most abundant large non-game fish species present were white sucker

(0.9%) and black redhorse (0.4%). The most abundant small non-game fish species present in the samples were central stoneroller (28.6%), Ozark minnow (13.9%), and bluntnose minnow (7.5%). Along with the Miller County River Hills Subbasin, this subbasin had a higher percentage of white crappie collected than any of the other subbasins. The Dry Auglaize Creek Subbasin also had the greatest percentage of white suckers and central stonerollers collected than any other subbasin.

The least abundant fish species' captured within this subbasin were spotted bass and black bullhead with only three specimens of each of these species present within the samples. Since 1931, hornyhead chub has not been collected by MDC. The blacknose shiner was the only fish species of conservation concern captured within the Dry Auglaize Creek Subbasin.

Lower Lake of the Ozarks Hills Subbasin Fish Community Samples

MDC has not taken fish community samples within this subbasin.

Deer Creek Subbasin Fish Community Samples

Within this subbasin, MDC collected four samples at two unique sites. Samples were taken in 1966, 1975, 1995, and 2000. All samples of this subbasin were taken using seining supplemented with visual observations. One thousand two hundred and thirteen fish were collected representing thirty-two species.

The most abundant game fishes collected in this subbasin were bluegill (5.3%), longear sunfish (5.3%), smallmouth bass (2%), and green sunfish (1.9%). The most abundant large non-game fish species present were golden redhorse (1%), northern hogsuckers (0.9%), and black redhorse (0.8%). The most abundant small non-game fish species present in the samples were bleeding shiner (36%), rainbow darter (10.1%), and Ozark minnow (9.3%). The Deer Creek Subbasin had a greater percentage of longear sunfish, black redhorse, bleeding shiners, and rainbow darters collected than any other subbasin.

The least abundant fish species captured within this subbasin were blackspotted topminnow, hornyhead chub, mottled sculpin, Ozark logperch, slender madtom, spotted bass, and yellow bullhead with only one specimen collected. Gizzard shad have not been collected by MDC since 1975. Species of conservation concern captured within this subbasin include plains topminnow and least darter.

Turkey Creek Subbasin Fish Community Samples

Within this subbasin, MDC has taken four samples representing four unique sites. Samples were taken in 1966, 1975, and 1995. All samples of this subbasin were taken using seining equipment with one sample being supplemented with visual observations. One thousand nine hundred fish were collected representing thirty-three species.

The most abundant game fishes collected in this subbasin were longear sunfish (2.3%) and bluegill (0.8%). The most abundant large non-game fish species present was northern hogsucker (0.8%). The most abundant small non-game fish species collected were Ozark minnow (23%) and bleeding shiner (21.7%).

The least abundant fish species captured within this subbasin were black redhorse, creek chub, longnose

gar, redfin shiner, and smallmouth bass with only one specimen of each of these collected. Since 1966, hornyhead chub has not been collected by MDC within this subbasin. Species of conservation concern captured within this subbasin include plains topminnow and least darter.

AmerenUE Fish Community Collections

AmerenUE has taken yearly fish community samples in the Lower Osage River from 1980-2000 using electrofishing equipment with AC current. AmerenUE's samples represent 6 unique sampling sites and contain sixty species totaling 45,444 specimens (Table 23).

The most abundant game fishes represented within these samples were bluegill (8.9%), white crappie (6.5%), spotted bass (4.3%), largemouth bass (2.6%), and white bass (2.4%). The most abundant large non-game fish present were freshwater drum (6.2%), common carp (3.9%), and river carpsucker (1.9%). The most abundant small non-game fish species present in the samples was gizzard shad (45%) and brook silverside (0.1%).

The least abundant fish species captured by AmerenUE in the Lower Osage River were banded sculpin, northern studfish, silver carp, silver lamprey, black bullhead, red shiner, southern redbelly dace, and sauger with only one specimen of each species collected. The banded sculpin has not been collected by AmerenUE during fish community sampling efforts in the Lower Osage River since 1980. The southern redbelly dace has not been captured since 1981. Species of conservation concern captured by AmerenUE within the Lower Osage River include paddlefish, highfin carpsucker, blue sucker, and mooneye.

When compared with MDC fish community samples taken by electrofishing, AmerenUE has made considerably more samples in the Lower Osage River than MDC. Whereas AmerenUE took yearly samples for 20 years (1980-2000), MDC fish collections made on the Osage River below Bagnell Dam with electrofishing equipment consist of only two samples taken in 1963: one sample southeast of Taos and one sample north of St. Thomas. The electrofishing equipment used by the two organizations may have differed substantially since MDC's collections consisted of more small non-game fish species than the samples of AmerenUE.

The two MDC collections made on the Lower Osage River using electrofishing consisted of 951 fish representing 25 species. Species that were collected by MDC electrofishing in 1963 but not collected by AmerenUE from 1980-2000 included: northern pike, gravel chub, johnny darter, bleeding shiner, ghost shiner, sand shiner, Ozark minnow, channel shiner, bluntnose minnow, fantail darter, Missouri saddled darter, mimic shiner, and slenderhead darter. The most abundant game species in MDC's 1963 samples were spotted bass (3.7%) and bluegill (1.7%). Although large non-game fish species were observed during at least one of these MDC samples, none were captured or counted. The most abundant small non-game fish species collected by MDC were channel shiner (39%), emerald shiner (17.7%), and bluntnose minnow (13.2%). In the samples of AmerenUE taken in the 1980-2000, gizzard shad comprised 45% of the samples. However, in the collections made by MDC in 1963, no gizzard shad were captured. The gizzard shad is a common, prolific, widely-distributed generalist species over its entire range. It has been known to increase in abundance in other rivers such as the Missouri River following the construction of upstream reservoirs (Pflieger 1997).

The Osage River below Bagnell Dam may have undergone shifts in species presence and abundance possibly from the peaking-style discharges currently and historically released by AmerenUE at Bagnell Dam or possibly emigration of eggs, larval, YOY, or adult gizzard shad through the turbines of Bagnell Dam. Adult gizzard shad are currently very abundant in the Osage River below Bagnell Dam and grow to sizes which make them essentially immune to predation and able to compete for food and space with more desirable species. It would appear from the current samples obtained that gizzard shad may have increased in abundance and possibly have replaced or out competed other small non-game fish species such as the once abundant channel shiners, emerald shiners, and bluntnose minnows in the Lower Osage River. Further sampling in the Osage River below Bagnell Dam will be necessary to confirm if these species shifts are real.

MDC Fish Samples and Management of Lake of the Ozarks

Lake of the Ozarks fishery is made up of many key gamefish species which support over 1 million fishing trips per year. Stoner (2000) lists largemouth bass, spotted bass, crappie, blue, flathead, and channel catfishes, walleye, white bass, striped bass x white bass hybrids, and paddlefish as the key gamefishes found in Lake of the Ozarks. A detailed description of the stocking and management of these fishes can be found in Lake of the Ozarks Management Plan. Gizzard shad populations in the lake are normally high and provide the bulk of prey for all gamefishes in Lake of the Ozarks with the exception of the paddlefish (Stoner 2000).

Amphibians and Reptiles

There is a diverse assemblage of amphibians and reptiles found in the East Osage River Basin (Johnson 2000) (Table 24). Amphibian species of conservation concern include the green treefrog, ringed salamander, four-toed salamander, and the grotto salamander. Reptile species of conservation concern include the eastern collared lizard and the northern scarlet snake.

Aquatic Invertebrates

Aquatic Macroinvertebrates

The USACE conducted a study of macroinvertebrates within the basin to describe the possible impacts of Truman Dam on these organisms (Kersh 1989). Numerous macroinvertebrates were sampled from 5 sites on Lake of the Ozarks from Truman Dam to Lake of the Ozarks River Mile 17 as well as from the following tributary streams to Lake of the Ozarks: Turkey Creek, Deer Creek, Big Buffalo Creek, Little Buffalo Creek, and Rainy Creek.

Overall, benthic communities sampled within Lake of the Ozarks were characterized by limited diversity and tolerant organisms. Diversity of organisms decreased as one went downstream within the lake. The benthic communities in the Truman outlet channel and Upper Osage Arm of Lake of the Ozarks were

similar with more than 40 taxa observed. Midges (Chironomidae) and the phantom midge (Chaoborus) were the dominant taxa observed. Oligochaetes, the burrowing mayfly (Hexagenia), sphaeriid clams, leeches, (Hirudinea), and dipterans were also observed.

The study concluded there was no significant change in benthic diversity within Lake of the Ozarks for 11 years after Truman Dam began operation. However, it appeared that a tributary stream to Lake of the Ozarks, Little Buffalo Creek, where it was influenced by Truman Dam discharges had experienced a slight downward trend in benthic diversity.

The study also concluded that benthic macroinvertebrate densities within Lake of the Ozarks had changed based on the 11 years of record. There were significantly lower benthic densities in the outlet area directly below Truman Dam downstream to Lake of the Ozarks RM 87 in 1987 than eleven years previous. Evidence suggested that the lower benthic diversities observed were a reflection of the degree of substrate alteration in the reach caused by the discharge of Truman Dam. It appeared that discharges at or above 35,000 cfs from Truman Dam resulted in substantial bed erosion and significantly lower benthic macroinvertebrate densities (Kersh 1989).

Finni (1982) and Finni and Kubb (1982) sampled benthic macroinvertebrate communities within Lake of the Ozarks to determine if residential and commercial development affected the diversity or density of these organisms. Similar to the study of Kersh (1989), midges (chironimidae), worms (Oligochaeta), and the phantom midge (Chaoborus) were the dominant taxa. Leeches (Hirudinea), caddisflies (Tricoptera), mayflies (Ephemeroptera), damselflies (Odonata), snails and clams (Mollusca) were also observed. The level of cove development or numbers of boat docks, ramps, and retaining walls did not appear to affect the diversity or density of benthic macroinvertebrates in this study.

Union Electric, now AmerenUE conducted a study of benthic macroinvertebrates below Bagnell Dam. Sixty taxa were identified from three shallow riffle areas 4 to 21 miles downstream from the dam. Midges were the dominant taxa identified comprising 45% of the samples. Other taxa identified included isopods, Oligochaetes, flatworms, caddisflies, mayflies, amphipods, hydroids, gastropods, and Corbicula clams (UEC 1982).

Duchrow (1984) studied invertebrates of the Lower Osage River and the major mainstem tributaries of the Lower Osage River. Taxa of invertebrates were collected, identified, and categorized as to their degree of pollution tolerance. Pollution intolerant invertebrate species (those found in areas of good water quality) were found in the Maries River, Tavern Creek, Gravois Creek, Dry Auglaize Creek, Wet Glaize Creek, Deer Creek, Turkey Creek, and Big Buffalo Creek. These areas were thus classified as unpolluted. Moderately polluted streams were designated based on the presence of moderately pollution tolerant species at those sites. Moderately polluted streams included Cole Camp Creek, the Osage River eleven miles below Bagnell Dam, the Osage River 4 miles above the mouth of the Osage River, and below Ozark Fisheries, Inc. on Mill Creek in the Wet Glaize Creek Subbasin. Only pollution tolerant species were collected 4 miles below Bagnell Dam. This section of the Osage River therefore was classified as polluted. The presence of only pollution tolerant invertebrate species at that site was due to poor water quality discharged through Bagnell Dam.

Mussels

Freshwater mussels were plentiful in the basin prior to the boom of the commercial button industry in the 1880's. Thousands of tons of mussels were taken from rivers of the basin using long tongs, rakes, hand picking, and dredging. Mussels were loaded into tanks and boiled or steamed for up to 30 minutes. The flesh was carefully checked for pearls and then often thrown back in the river or buried to avoid the stench it created. Occasionally the mussel meat was used to feed hogs or chickens. Cleaned shells were then shipped to button factories for processing (Oesch 1995).

Freshwater mussel populations were soon depleted and concern over the future of this resource heightened. Attempts were made to artificially propagate mussels but these attempts met with little success. After World War II, plastic buttons began replacing those made from mussel shells. Mussel harvest was banned from Missouri's waters in 1976 (Oesch 1995). Mussel populations continue to decline however. Depletion of fish stocks, changes in water quality, habitat degradation (gravel mining, urbanization, stream channelization, and dam construction), and introduction exotic species are all possible contributors to the mussel's decline.

There are 39 species of freshwater mussels in the basin. All species have been collected since 1965 (Table 25). The pink mucket mussel is a federally and state endangered species. The elephant-ear mussel is state endangered.

The scale shell was recently collected in the basin and should soon be listed as endangered. Other freshwater mussel species of conservation concern found in the basin are the hickorynut, black sandshell, spectaclecase, rock-pocketbook, and giant floater. All freshwater mussel species of conservation concern within the basin are found in the Miller County River Hills and Lower Osage River Subbasins (Table 26).

Species of Conservation Concern, Threatened, or Endangered

A number of plant, invertebrate, fish, amphibian, reptile, bird, and mammal species of the basin have become imperiled due to habitat loss, overharvest, competition with exotic species, or other human-induced influences. Both the Missouri State Government and U.S. Federal Government have recognized certain imperiled species and protected them as necessary. All federally endangered species are protected by the Endangered Species Act of 1973 and by Missouri Endangered Species Law 252.240. The State designated endangered species of the basin include: running buffalo clover, Mead's milkweed, pink mucket mussel, elephant-ear mussel, lake sturgeon, Niangua darter, bald eagle, greater prairie chicken, gray bat, and the Indiana bat. In addition, species of conservation concern have been ranked according to their susceptibility to extirpation or extinction (Table 26). Table 27 shows the MDC designated species of conservation concern of the East Osage River Basin by subbasin.

Niangua Darter

The Niangua darter is only found in Missouri and is considered critically imperiled in Missouri because of its rarity and its vulnerability to extirpation. It is federally listed as threatened and by Missouri as

endangered. A recovery plan was finalized (Pflieger 1989), and a recovery team was established in 1991 (Mattingly and Galat 1998). Optimal habitat for this species is shallow clear pools in medium-size streams having gravel or rocky bottoms. This species can not live in silt-laden water. Niangua darters forage along the stream bottom for aquatic insects, crustaceans, and snails. Reproduction occurs in shallow riffles in mid-spring (Pflieger 1997).

Reservoir construction has been a significant factor leading to the decline of the Niangua darter (Pflieger 1997). Reservoirs eliminate Niangua darter populations through destruction of habitat and by range fragmentation, resulting in small, isolated populations that are more vulnerable to local extirpations. Destabilization of stream channels by gravel mining and channelization, and nutrient enrichment of streams as a result of livestock production or municipal sewage treatment, are other threats to its long-term survival.

In the basin, the Niangua darter is found in Lower Maries, Upper Maries and Tavern Creek Subbasins (Figure 20). It is found in 3.3 miles of Little Maries Creek in Lower Maries Subbasin, and 27.2 miles of the Maries River in the Lower Maries and Upper Maries Subbasins. In the Tavern Creek Subbasin, Niangua darters are found in 3.9 miles of Barren Fork, 3.2 miles of Brushy Fork, 1.6 miles of Little Tavern Creek, and 34.6 miles of Tavern Creek (Table 27). All in-stream activities within these areas should be coordinated with MDC and the U.S. Fish and Wildlife Service. Special conditions apply March 15-June 15 annually. All areas are within State Critical Habitat, most of these areas are also federally designated Critical Habitat.

Lake Sturgeon

The lake sturgeon is a primitive fish found in larger rivers of northcentral and northeastern North America. They are covered with several lengthwise rows of bony plates, or scutes, and their cone-shaped snout is long and prominent with four large barbels which dangle from the underside of the snout. The lake sturgeon is reported to reach a length of eight feet and a weight of 310 pounds.

Lake sturgeon were very abundant in Missouri before the mid-1800's. Commercial harvest began in 1860 and harvest peaked in 1890. The population was decimated by the early 1900's. The basin was known for large harvests of lake sturgeon suggesting that this area may have supported a spawning population prior to decimation of the populations and construction of Lake of the Ozarks (Carlson and Pflieger 1981).

Missouri considers the lake sturgeon to be endangered in the state and especially vulnerable to extirpation. Globally, the species is considered to be rare or uncommon but not presently in danger of extinction.

Lake sturgeon are a long-lived species. They mature slowly and begin reproducing when 20 years old when they will be four feet long and weigh around 25 pounds. They spawn at 2-6 year intervals rather than annually. A slow maturation rate and an infrequent spawning interval contributes to slow recovery after its populations have been depleted. The maximum age reported for a lake sturgeon was 152 years old.

To aid lake sturgeon populations' recovery, MDC artificially-reared and released 45,000 young lake

sturgeon into Missouri waters from 1984-1990. These fish have and are continuing to be incidentally captured in Missouri's larger rivers. Given the slow maturation rate, these stocked fish should soon begin to reach sexual maturity and presumably will establish a more stable naturally reproducing population in future years.

It is presumed that overharvest was the principal cause of the decline of the lake sturgeon. However, blockage of spawning runs by dams, destruction of spawning habitat by siltation, pollution, and drainage, and decline in the food supply (mollusks) may have been contributing factors and will hinder recovery of this species in future years.

Thirteen other fish species are listed as species of conservation concern in the basin (Table 34). Species which are imperiled because of rarity or because some factor makes them very vulnerable to extirpation include blacknose shiner, ghost shiner, western silvery minnow, Alabama shad, mooneye, highfin carpsucker, southern cavefish, least darter, and bluestripe darter. Species which are considered rare or uncommon include paddlefish and plains topminnow. The northern pike is considered widespread, abundant, and apparently secure in Missouri but of long-term concern (MDC Natural History Database 2001).

Exotic Species

Fish Exotics

There are 10 fish species known from the basin which are not presumed to have been present prior to European settlement of the region. The presence of these exotics within the basin is the result of stocking or introduction. The bighead carp, common carp, goldfish, spotted bass, and western mosquitofish now have established naturally reproducing populations within the basin. The brown trout, rainbow trout, striped bass, grass carp, and muskellunge are present in the basin only as stocked individuals with no documented natural reproduction.

The influence that these exotics have had on native populations is unknown. Exotic species are often more competitive than native species and can cause decline or extirpation of native fauna.

Mussel Exotics

The Asiatic clam (Corbicula fulminea) was introduced into the United States in the late 1930's. It currently occupies the southeast half of Missouri and is expected to spread across the entire state within a decade. Unlike the mussels indigenous to the United States, the Asiatic clam produces a free-swimming larval form known as a veliger. The rapid expansion of the range of the essentially non-mobile Asiatic clam is most likely caused by incidental transportation of the free-swimming veliger from river to river in the water of angler's bait buckets.

The zebra mussel (Dreissena polymorpha) is a small native to the Caspian Sea in Europe. The zebra mussel like the Asiatic clam has a free swimming larval form which facilitates rapid range expansion. The zebra mussel spread throughout Europe in the 1800's and now is rapidly expanding into northern

Asia as well as into the Eastern United States. This highly invasive, damaging species threatens populations of native mussels and other benthic aquatic species. Zebra mussels clog water intake pipes and attach to boat hulls in densities as high as 700,000 individuals per square meter. Zebra mussels were first documented from the Northeastern United States in 1986. By 1991, zebra mussels had spread through the Great Lakes, down the Illinois River, and down the Mississippi River to the waters of Missouri. MDC produces a brochure describing how to prevent the further expansion of the zebra mussel to Missouri waters.

Some pictures courtesy of Native Fish Conservancy.

Figure 19. MDC Fish Community Sampling Sites for the East Osage Basin

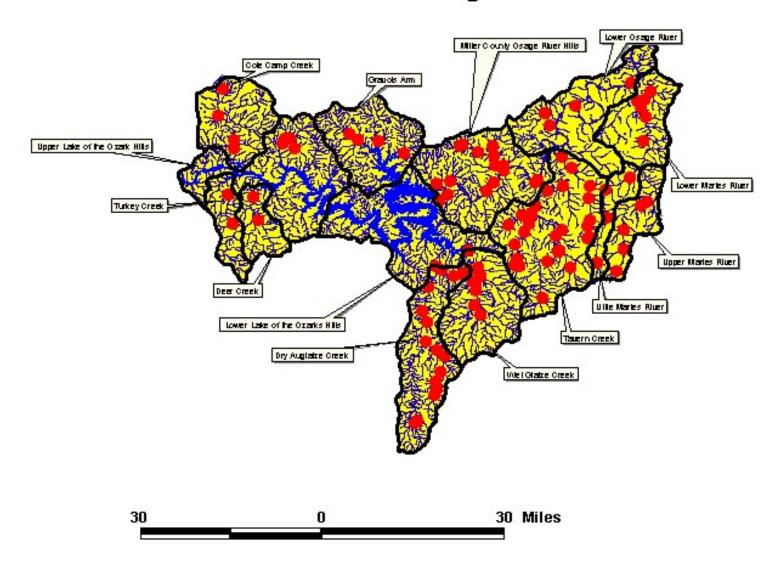
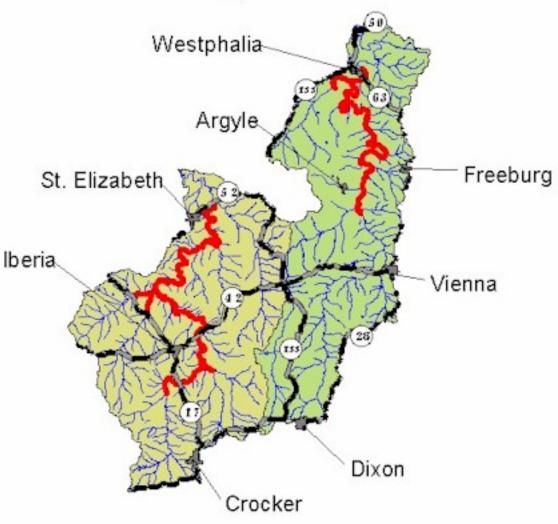




Figure 20. Niangua Darter Range in the East Osage River Basin





Lower Maries, Upper Maries,

and Little Maries River subbasins



Table 17. Species composition of more abundant gamefish, large non-game fish, and small non-game fish in MDC community fish samples for each subbasin based on all MDC samples from the basin to date. Note: Values in bold represent the greatest percentage of that species.

Common Name	Lower Osage R.	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills	Gravois Arm	Lower LOZ Hills	Mille Co Osg I Hills
GAMEFISH														
Green sunfish	1.16	0.36	0.23	0.15	0.66	0.87	2.53	1.98	0.21	1.55	13.2	0.40	-	0.00
Bluegill	4.67	1.05	0.35	0.81	0.81	0.03	2.28	5.28	0.79	0.76	5.32	0.99	-	5.47
Longear sunfish	3.08	3.97	0.79	1.58	1.16	0.34	0.17	5.28	2.26	0.99	0.44	5.05	-	1.4
Smallmouth bass	0.43	0.47	0.31	1.10	0.95	0.06	0	2.14	0.05	0.10	9.90	2.18	-	0.1
Spotted bass	1.34	0.51	0	0.02	0.15	0.04	0.02	0.33	0.53	0.21	0.13	0.10	-	0.5
Largemouth bass	0.62	0.30	0.08	0.12	0.11	0.06	0.35	1.15	0.47	0.45	1.01	2.97	-	0.20
White crappie	0	0	0	0	0.01	0	0.46	0	0	0	0	0	-	0.4
Channel catfish	0.46	0.05	0	0	0.01	0	0	0	0	0.02	0.13	0	-	1.3
Yellow bullhead	0.03	0.15	0.32	0.15	0.04	0	0.14	0.32	0.16	0.03	1.01	0.10	-	0.0

														<u> </u>
LARGE NON-C	SAME FI	SH												
Common carp	0.05	0.50	0	0	0.002	0.03	0.02	0.16	0	0.02	0	0	-	0.3
White sucker	0	0	0	0	0.06	0.21	0.89	0	0	0	0	0	-	0.0
Northern hogsucker	0.15	0.10	0	0.05	0.24	0.50	0.10	0.91	0.80	0.05	8.16	1.29	-	0.0
Black redhorse	0.73	0.66	0.01	0.03	0.43	0.34	0.38	0.82	0.05	0.28	0	0	-	0
Golden redhorse	0.07	0.48	0.01	0	0.17	0.21	0.03	1.00	0	0.40	0	0	-	0.
Shorthead redhorse	0.84	0.05	0	0	0.01	0	0	0	0	0	0	0	-	0.
River carpsucker	0.03	0	0	0	0	0.01	0	0	0	0.03	0	0	-	1.
Longnose gar	0.15	0.01	0	0	0.01	0	0	0	0.05	0	0	0	-	0.
SMALL NON-C	SAME FI	SH			1		,						,	
Largescale stoneroller	1.77	4.21	3.73	1.17	3.73	0.34	0.83	3.30	0	3.12	0.03	1.58	-	0.
Central stoneroller	2.67	1.17	13.9	10.2	8.08	3.35	28.6	2.06	0.37	5.07	0.52	4.75	-	1.
Gravel chub	1.34	0.23	0	0	0.10	0	0	0	0	0	0	0	-	14
Creek chub	0.26	0.05	2.12	2.03	0.59	0.71	4.41	0.66	0.05	0.81	7.95	2.48	-	0.
Bleeding shiner	15.6	20.4	19.3	29.5	27.1	29.1	6.5	36.7	21.7	9.4	20.2	25.3	-	3
												RC		

Wedgespot shiner	0	9.83	0.01	0.03	3.42	3.06	0	0	0	0	0	0	-	0.02
Emerald shiner	5.56	0	0	0	0.003	0	0	0	0	0	0	0	-	17.0
Ozark minnow	24.9	22.1	14.7	13.6	14.8	12.3	13.9	9.3	23.1	38.1	0.28	11.3	-	3.64
Southern redbelly dace	0	0	7.28	1.72	4.76	0.42	0.34	0.08	0	0	6.86	1.29	-	0.78
Bluntnose minnow	2.56	1.88	0.48	0.36	1.41	1.42	7.47	0.16	6.63	5.07	0	1.09	-	9.66
Fathead minnow	0	0	0.01	0	0	8.80	0.12	0	0	0.86	0	0.10	-	0.03
Northern studfish	3.18	1.35	13.1	8.14	4.6	3.89	0.66	6.92	8.21	0.71	1.19	14.6	-	3.81
Brook silverside	1.26	5.94	1.52	1.86	1.64	0.33	0.89	3.30	4.58	6.39	0	1.49	-	8.12
Rainbow darter	1.87	8.66	3.41	4.01	6.19	5.52	1.40	10.1	3.42	5.32	2.00	2.87	-	0.60
Striped fantail darter	2.11	5.05	5.82	9.86	4.55	7.01	0.51	1.40	5.05	2.46	2.72	0.89	-	0.78
Orangethroat darter	7.61	1.22	8.33	6.73	3.70	3.10	4.36	2.80	0.26	8.84	3.04	3.56	-	1.97

Table 18. Fish present in MDC fish community samples of the East Osage River Basin by subbasin and most recent time period collected*

Common Name	Lower Osage R.	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills	Gravois Arm	Lower LOZ Hills	Miller Co Osg R Hills
Chestnut lamprey		В			C	В								C
Shovelnose sturgeon														С
Lake sturgeon														A
Longnose gar	В	D			D	В				D				C
Shortnose gar	В	D			D									C
American eel	В													С
Alabama shad	В													
Gizzard shad	D	D			D	В		С	D	A		A		D
Skipjack herring														С
Mooneye					В									
Goldeye	В													С

Largescale stoneroller	D	D	D	D	D	D	D	D	D	D	D	D	D
Central stoneroller	D	D	D	D	D	D	D	D	D	D	D	D	D
Red shiner	В	D	A	A	D	D	D			A		A	С
Common carp	В	D			D	D	D	D	D	D			D
Goldfish						D							D
Gravel chub	В				D								С
Bleeding shiner	D	D	D	D	D	D	D	D	D	D	D	D	D
Redfin shiner	A	D	A	A	D		D		D	D			С
Wedgespot shiner		D	A	D	D	D							С
Hornyhead chub	D	D	D	D	D	D	A	D	В	A	C	D	D
Mimic shiner	В												D
Emerald shiner	В												C
Golden shiner					C	D	D			D		D	D
Ghost shiner	В	A											D
Blacknose shiner			A	A			D						
Channel shiner	В												

<u> </u>]				<u> </u>			<u> </u>	<u> </u>			<u> </u>
Sand shiner	В	D	A		D	D	D			D		A	C
Silverband shiner	В												
Ozark minnow	D	D	D	D	D	D	D	D	D	D	D	D	D
Western silvery minnow	В	A			С								
Rosyface shiner	D	D			D	D	D						D
Striped shiner													D
Suckermouth minnow	В	С			С	С				A			A
Southern redbelly dace	D		D	D	D	D	D	D			D	D	D
Bluntnose minnow	D	D	D	D	D	D	D	D	D	D		D	D
Fathead minnow			D			D	С			D		A	D
Gravel chub	В	С			D								С
Creek chub	D	С	D	С	D	D	D	D	D	D	D	D	D
Speckled chub													С
Silver chub	В												
White sucker					D	D	D						D

Blue sucker													С
Highfin carpsucker													С
Northern hogsucker	D	D	C	C	D	D	D	D	D	D	D	D	D
Bigmouth buffalo		D											С
Smallmouth buffalo	D												C
Black buffalo													C
Quillback	В					D							C
Black redhorse	D	D	C	C	D	D	D	D	D	D			D
Golden redhorse	D	D	A		D	D	D	D	C	D			D
Shorthead redhorse	В	D			C	В							C
Silver redhorse	D	D			D	В							C
River redhorse													C
Black bullhead	A			C	C		D						С
Yellow bullhead	D	C	C	C	D	C	D	D	D	D	C	D	D

Channel catfish	В	D			D					A	В		С
Flathead catfish	В	D											С
Blue catfish													С
Freckled madtom	В				A								
Slender madtom	D	D	D	D	D	D	D	D	D	D	D	D	D
Stonecat	В				D								
Northern studfish	D	D		D	D	D	D	D	D	D	D	D	D
Blackspotted topminnow	D	D	D	D	D	D	D	D	D	D	D	A	D
Plains topminnow	D	C	D	D	D			В		D	D	D	D
Western mosquitofish		D			D	D	D						D
Brook silverside	D	D	D	D	D	D	D	D	D	D		A	D
Mottled sculpin	D				D	D		D					D
Banded sculpin	В					D				С	D	A	
Ozark sculpin					D						D	D	D
White bass	,	D	,		D	В	,	,	,		,	,	C

Rock bass		D	С	C									D
River carpsucker	В					В				A			C
Green sunfish	D	D	D	D	D	D	D	D	D	D	D	D	D
Warmouth		D											
Orangespotted sunfish		A			С		A			В			A
Bluegill	D	D	D	D	D	D	D	D	D	D	D	D	D
Longear sunfish	D	D	D	D	D	D	D	D	D	D	В	D	D
Smallmouth bass	D	D	D	D	D	D	A	D	В	D	D	D	D
Spotted bass	C	D		C	D	D	D	D	D	D	D	D	D
Largemouth bass	D	D	D	D	D	D	D	D	D	D	С	D	D
White crappie					D	В	D						С
Black crappie	В	D				В							D
Greenside darter	D	D	C	D	D	D	D	D	D	D		A	D
Rainbow darter	D	D	D	D	D	D	D	D	D	D	D	D	D
Fantail darter				D		D	D	D	D	D	D	D	D
Least darter								В		D		A	

Niangua darter		D			D								,
uarter													
Johnny darter	D	A	A		D								C
Stippled darter	D	С	С	D		D				D	D	A	D
Orangethroat darter		D	D	D	D	D	D	D	D	D	D	D	D
Banded darter	В	D			D	D				A			C
Missouri saddled darter	C	D			D	D							C
Slenderhead darter	В				D								D
Gilt darter	В												С
Logperch	В				D	D	D	D	C	D		D	D
Northern pike	В												C
Walleye						В							C
Sauger	В	D											C
Freshwater drum	В	D			С	В			D	D			D

A = 1931-1946 collections

B = 1947-1973 collections

C = 1974-1990 collections

D = 1991-2001 collections

Table 19. Fish present in MDC fish community samples sampled by seining or visual observation

in the East Osage River Basin by subbasin and most recent time period collected*

Common Name	Lower Osage R.	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills	Gravois Arm	Lower LOZ Hills	Miller Co Osg R Hills
Chestnut lamprey		В			С									C
Shovelnose sturgeon														С
Lake sturgeon														A
Longnose gar	В				D					D				C
Shortnose gar	В				D									C
American eel														С
Gizzard shad	D	D			D			C	D	A		A		D
Skipjack herring														С
Mooneye					В								1	1
Goldeye	В													C
Largescale stoneroller	D	D	D	D	D	D	D	D	D	D	D	D		D

Central stoneroller	D	D	D	D	D	D	D	D	D	D	C	D	D
Red shiner	В	D	A	A	D	D	D			A		A	С
Common carp	В				D	D	D	D	D	D			D
Goldfish						D							D
Gravel chub	В				D								С
Bleeding shiner	D	D	D	D	D	D	D	D	D	D	D	D	D
Redfin shiner	A	D	A	A	D		D		D	D			С
Wedgespot shiner		D	A	D	D	D							С
Hornyhead chub	D	D	D	D	D	D	A	D	В	A	C	D	D
Mimic shiner													D
Emerald shiner	В												С
Golden shiner					C	D	D			D		D	D
Ghost shiner		A											D
Blacknose shiner			A	A			D						
Sand shiner	В	D	A		D	D	D			D		A	С
Ozark minnow	D	D	D	D	D	D	D	D	D	D	D	D	D

Western silvery minnow	В	A			C								
Rosyface shiner	D	D			D	D	D						D
Striped shiner													D
Suckermouth minnow	В	C			C					A			A
Southern redbelly dace	D		D	D	D	D	D	D			D	D	D
Bluntnose minnow	D	D	D	D	D	D	D	D	D	D		D	D
Fathead minnow			D			D	С			D		A	D
Gravel chub	В	C			D								С
Creek chub	D	C	D	C	D	D	D	D	D	D	D	D	D
Speckled chub													С
White sucker					D	D	D						D
Blue sucker													C
Highfin carpsucker													C
Northern hogsucker	D	D	C	C	D	D	D	D	D	D	D	D	D
Bigmouth buffalo													C

Smallmouth buffalo	D												С
Black buffalo													C
Quillback	В					D							С
Black redhorse	D	D	С	C	D	D	D	D	D	D			D
Golden redhorse	D	D	A		D	D	D	D	C	D			D
Shorthead redhorse		В			C								C
Silver redhorse					D								C
River redhorse													C
Black bullhead	A			C	C		D						C
Yellow bullhead	D	C	C	C	D	C	D	D	D	D	C	D	D
Channel catfish					D					A			C
Flathead catfish													C
Blue catfish													С
Freckled madtom					A								

Slender madtom	D	D	D	D	D	D	D	D	D	D	D	D	D
Stonecat					D								
Northern studfish	D	D		D	D	D	D	D	D	D	D	D	D
Blackspotted topminnow	D	D	D	D	D	D	D	D	D	D	D	A	D
Plains topminnow	A	C	D	D	D			В		D	D	D	D
Western mosquitofish		D			D	D	D						D
Brook silverside	D	D	D	D	D	D	D	D	D	D		A	D
Mottled sculpin	D				D	D		D					D
Banded sculpin						D				C	D	A	
Ozark sculpin					D						D	D	D
White bass					D								С
Rock bass		В	С	C									D
River carpsucker	В									A			C
Green sunfish	D	D	D	D	D	D	D	D	D	D	D	D	D
Warmouth		D											

Orangespotted sunfish		A			C		A			В			A
Bluegill	D	D	D	D	D	D	D	D	D	D	D	D	D
Longear sunfish	D	D	D	D	D	D	D	D	D	D		D	D
Smallmouth bass	D	D	D	D	D	D	A	D	В	D	D	D	D
Spotted bass	С	D		C	D	D	D	D	D	D	D	D	D
Largemouth bass	D	D	D	D	D	D	D	D	D	D	C	D	D
White crappie					D		D						С
Black crappie	В												D
Greenside darter	D	D	С	D	D	D	D	D	D	D		A	D
Rainbow darter	D	D	D	D	D	D	D	D	D	D	D	D	D
Fantail darter		D		D		D	D	D	D	D		D	D
Least darter								В		D		A	
Niangua darter		D			D								
Johnny darter	D	A	A		D								С
Stippled darter	С	С	C	D		D				D	D	A	D

Orangethroat darter		D	D	D	D	D	D	D	D	D	D	D	D
Banded darter		D			D	D				A			С
Missouri saddled darter	C	D			D	D							C
Slenderhead darter					D								D
Gilt darter													С
Logperch		D			D	D	D	D	С	D		D	D
Northern pike													С
Walleye													C
Sauger	В												C
Freshwater drum	В				C				D	D			D

Time period collected: A = 1931-1946, B = 1947-1973, C = 1974-1990, D = 1991-2001

 $^{^{1}}$ The most recent collection period for Lower Osage R. was B (1947-1973).

 $^{^2}$ The most recent collection period for Upper LOZ Hills was C (1974-1990).

Table 20. Fish present in MDC fish community samples sampled by electrofishing in East Osage River Basin by subbasin and most recent time period collected*

Common Name	Lower Osage R ¹	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills ²	Gravois Arm	Lower LOZ Hills	Miller Co Osg R Hills
Longnose gar		D												
Shortnose gar		D												
Gizzard shad	В	D												
Largescale stoneroller	В													
Red shiner	В													
Common carp	В	D												
Gravel chub	В													
Bleeding shiner	В													
Hornyhead chub											C			
Mimic shiner	В													

Emerald shiner	В								
Ghost shiner	В								
Channel shiner	В								
Sand shiner	В								
Ozark minnow	В								
Bluntnose minnow	В								
Gravel chub	В								
Creek chub							C		
Northern hogsucker		D					С		
Bigmouth buffalo		D							
Black redhorse		D							
Golden redhorse	В	D							
Shorthead redhorse	В	D							
Silver redhorse		D							

Yellow bullhead							С		
Channel catfish		D					В		
Flathead catfish		D							
Brook silverside	В								
White bass		D							
Rock bass		D							
Green sunfish	В						C		
Bluegill	В	D					C		
Longear sunfish	В	D					В		
Smallmouth bass	В						С		
Spotted bass	В	D							
Largemouth bass	В	D					C		
Black crappie		D							
Fantail darter	В								

Johnny darter	В							
Missouri saddled darter	В							
Logperch	В	D						
Sauger		D						
Northern pike	В							
Freshwater drum		D						

Time period collected: B = 1947-1973, C = 1974-1990, D = 1991-2001

Table 21. Fish species of the East Osage River Basin.						
Common Name	Scientific Name	Status*				
LARGE FISH						
Alabama shad	Alosa alabamae	В				
American eel	Anguilla rostrata	A, B, C, D				
Bighead carp	Hypophthalmichthys nobilis	D				
Bigmouth buffalo	Ictiobus cyprinellus	B, C, D				
Black crappie	Pomxis nigromaculatus	B, C, D				
Black redhorse	Moxostoma erythrurum	A, B, C, D				
Black bullhead	Ameiurus melas	A, B, C, D				
Black buffalo	Ictiobus niger	С				
Blue catfish	Ictalurus furcatus	B, C, D				
Blue sucker	Cycleptus elongatus	B, C				
Bluegill	Lepomis cyanellus	A, B, C, D				
Brown trout	Salmo trutta	K				

Channel catfish	Ictalurus punctatus	A, B, C, D
Chestnut lamprey	Ichthyomyzon castaneus	B, C, D
Common carp	Cyprinus carpio	A, B, C, D
Flathead catfish	Pylodictis olivaris	A, B, C, D
Freckled madtom	Noturus nocturnus	A, B
Freshwater drum	Aplodinotus grunniens	A, B, C, D
Gizzard shad	Dorosoma cepedianum	A, B, C, D
Golden redhorse	Moxostoma erythrurum	A, B, C, D
Goldeye	Hiodon alsoides	B, C, D
Goldfish	Carassius auratus	A, B, C, D
Grass carp	Ctenopharyngodon idella	D
Common Name	Scientific Name	Status*
Green sunfish	Lepomis cyanellus	A, B, C, D
Highfin carpsucker	Carpiodes velifer	B, C
Lake sturgeon	Acipenser fulvescens	A, D
Largemouth bass	Micropterus salmoides	A, B, C, D

Longear sunfish	Lepomis megalotis	A, B, C, D
Longnose gar	Lepisosteus osseus	A, B, C, D
Mooneye	Hiodon tergisus	В
Muskellunge	Esox masquinongy	K
Northern brook lamprey	Ichthyomyzon fossor	K
Northern pike	Esox lucius	B, C, D
Northern hogsucker	Hypentelium nigricans	A, B, C, D
Orangespotted sunfish	Lepomis humilis	A, B, C
Paddlefish	Polyodon spathula	K, D
Quillback	Carpiodes cyprinus	A, B, C, D
Rainbow Trout	Oncorhynchus mykiss	K
River carpsucker	Carpiodes carpio	A, B, C
River redhorse	Moxostama carinatum	A, B, C, D
Rock Bass	Ambloplites rupestris	B, C, D
Sauger	Stizostedion canadense	A, B, C, D
Shorthead redhorse	Moxostoma macrolepidotum	A, B, C, D

Shortnose gar	Lepisosteus platostomus	B, C, D
Shovelnose sturgeon	Scaphirhynchus platorynchus	В, С
Silver redhorse	Moxostoma anisurum	B, C, D
Skipjack herring	Alosa chrysochloris	B, C
Common Name	Scientific Name	Status*
Smallmouth buffalo	Ictiobus bubalus	A, B, C, D
Smallmouth bass	Micropterus dolomieui	A, B, C, D
Southern brook lamprey	Ichthyomyzon gagei	K
Striped bass	Morone saxatilis	K
Spotted bass	Micropterus punctulatus	A, B, C, D
Walleye	Stizostedion vitreum	A, B, C, D
Warmouth	Lepomis gulosus	B, D
White Crappie	Pomoxis annularis	A, B, C, D
White sucker	Catostomus commersoni	A, B, C, D
White bass	Morone chrysops	B, C, D

Yellow bullhead	Ictalurus natalis ameiurs	A, B, C, D				
NEKTONIC FISH						
Blacknose shiner Notropis heterolepis A, C, D						
Blackspotted topminnow	Fundulus oluvaceus	A, B, C, D				
Bleeding shiner	Notropis zonatus	A, B, C, D				
Bluntnose minnow	Pimephales notatus	A, B, C, D				
Brook silverside	Labidesthes sicculus	A, B, C, D				
Central Stoneroller	Campostoma Anomalum	A, B, C, D				
Channel shiner	Notropis wickliffi	В				
Creek chub	Semotilus atromaculatus	A, B, C, D				
Emerald shiner	Notropis atherinoides	A, B, C, D				
Fathead minnow	Pimephales promelas	A, B, C, D				
Ghost shiner	Notropis buchanani	A, B, C, D				
Golden shiner	Notemigonus crysoleucas	A, B, C, D				
Common Name	Scientific Name	Status*				

Hornyhead chub	Nocomis biguttatus	A, B, C, D
Largescale stoneroller	Campostoma oligolepis	A, B, C, D
Mimic shiner	Notropis volucellus	A, B, C, D
Northern studfish	Fundulus catenatus	A, B, C, D
Ozark minnow	Notropis nubilus	A, B, C, D
Plains topminnow	Fundulus sciadicus	A, B, C, D
Red shiner	Notropis lutrensis	A, B, C, D
Redfin shiner	Lythrurus umbratilis	A, B, C, D
Rosyface shiner	Notropis rubellus	A, B, C, D
Sand shiner	Notropis stramineus	A, B, C, D
Southern redbelly dace	Phoxinus erythrogaster	A, B, C, D
Silverband shiner	Notropis shumardi	В
Silver Chub	Macrhybopsis storeriana	В
Speckled chub	Macrhybopsis aestivalis	В
Striped shiner	Luxilus chrysocephalua	B, D
Studfish	Fundulus Catenatus	A, B, C, D

Wedgespot shiner	Notropis greenei	A, B, C, D						
Western silvery minnow	Hybognathus argyritis	В, С						
Western mosquitofish	Gambusia affinis	A, C, D						
	BENTHIC FISH							
Banded darter	Etheostoma zonale	A, B, C, D						
Banded sculpin	Cottus carolinae	A, B, C, D						
Fantail darter	Etheostoma flabellare ssp.	A, B, C, D						
Gravel chub	Erimystax x-punctatus	A, B, C, D						
Common Name	Scientific Name	Status*						
Gilt darter	Percina evides	B, C						
Greenside darter	Etheostoma blennioides	A, B, C, D						
Johnny darter	Etheostoma nigrum	A, B, C, D						
Least darter	Etheostoma microperca	A, B, C						
Logperch	Percina caprodes	B, D						
Missouri saddled darter	Etheostoma tetrazonum	A, B, C, D						
Mottled sculpin	Cottus bairdi	B, D						

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Niangua darter	Etheostoma nianguae	A, B, C, D
Northern orangethroat darter	Etheostoma s spectabile	A, B, C, D
Ozark logperch	Percina c fulvitaenia	A, B, C, D
Ozark sculpin	Cottus hypselurus	A, B, C, D
Rainbow darter	Etheostoma caeruleum	A, B, C, D
Slender madtom	Noturus exilis	A, B, C, D
Slenderhead darter	Percina phoxocephala	A, B, C, D
Speckled chub	Macrhybopsis aestivalis	С
Southern cavefish	Typhlichthys subterraneus	K
Stonecat	Noturus flavus	A, B, C, D
Stippled darter	Etheostoma punctulatum	A, B, C, D
Suckermouth minnow	Phenacobius mirabilis	A, B, C
Tadpole madtom	Noturus gyrinus	K

A=collected before 1946

B=collected between 1946 and 1973

C=collected from 1974-1990

D=collected from 1990-2001

K=known or probable occurrence within basin though species not represented in MDC community samples based on ineffective sampling methods for that species or rarity of species.

Table 22. Fish community sampling methods by subbasin

Method	Lower Osage R.	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills	Gravois Arm	Lower LOZ Hills	Miller Co Osg R Hills
Electrofishing	X	X									X			
Kick seine	X	X	X	X	X	X	X	X	X	X	X	X		X
Drag seine	X	X	X	X	X	X	X	X	X	X	X	X		X
Rotenone	X													
Visual	X	X			X	X	X	X	X	X	X	X		

Table 23. Fish species present in the samples of AmerenUE (1980-2000) and MDC (1963)taken by electrofishing in the Osage River below Bagnell Dam.

Common Name	AmerenUE # of each species	MDC # of each species	AmerenUE % of each species	MDC % of each species
Chestnut lamprey	49	-	0.11	-
Silver lamprey	1	-	<0.01	-
Longnose gar	263	-	0.58	-
Shortnose gar	517	-	1.14	-
Paddlefish	113	-	0.25	-
American eel	24	-	0.05	-
Gizzard shad	20,621	-	45.38	-
Skipjack herring	10	-	0.02	-
Mooneye	10	-	0.02	-
Goldeye	131	-	0.29	-
Largescale stoneroller	6	20	0.01	2.1
Central stoneroller	2	12	<0.01	1.26

Red shiner	1	10	<0.01	1.05
Common carp	1,793	-	3.96	-
Grass carp	165	-	0.36	-
Bighead carp	83	-	0.18	-
Silver carp	1	-	<0.01	-
Gravel chub	-	15	-	1.58
Bleeding shiner	-	10	-	1.05
Hornyhead chub	2	-	<0.01	-
Mimic shiner	-	2	-	0.21
Emerald shiner	12	168	0.03	17.67
Golden shiner	7	-	0.01	-
Ghost shiner	-	81	-	8.52
Channel shiner	-	374	-	39.33
Sand shiner	-	23	-	2.42
Ozark minnow	-	2	-	0.21
Southern redbelly dace	1	-	<0.01	-
Bluntnose minnow	-	126	-	13.25
White sucker	2	-	<0.01	-

Blue sucker	3	-	<0.01	-
Highfin carpsucker	32	-	0.07	-
Northern hogsucker	8	-	0.02	-
Bigmouth buffalo	661	-	1.45	-
Smallmouth buffalo	1,081	-	2.38	-
Black buffalo	60	-	0.13	-
Quillback	123	-	0.27	-
Black redhorse	214	-	0.47	-
Golden redhorse	598	-	1.31	-
Shorthead redhorse	525	-	1.15	-
Silver redhorse	40	-	0.09	-
River redhorse	69	-	0.15	-
Black bullhead	1	-	<0.01	-
Yellow bullhead	4	-	0.01	-
Channel catfish	966	-	2.12	-
Flathead catfish	28	-	0.06	-
Blue catfish	915	-	2.01	-
Northern studfish	1	-	<0.01	-

Brook silverside	55	31	0.12	3.26
Banded sculpin	1	-	<0.01	-
White bass	1,092	-	2.40	-
Striped bass	40	-	0.09	-
Rock bass	17	-	0.04	-
River carpsucker	889	-	1.96	-
Green sunfish	127	4	0.28	0.42
Warmouth	2	-	<0.01	-
Bluegill	4,048	16	8.91	1.68
Longear sunfish	391	9	0.86	0.94
Redear sunfish	13	-	0.03	-
Smallmouth bass	21	4	0.05	0.42
Spotted bass	1,977	35	4.35	3.7
Largemouth bass	1,201	2	2.64	0.21
White crappie	2,959	-	6.51	-
Black crappie	588	-	1.29	-
Fantail darter	-	1	-	0.11
Johnny darter	-	1	-	0.11

Missouri saddled darter	-	2	-	0.21
Slenderhead darter	-	1	-	0.11
Logperch	29	1	0.64	0.11
Northern pike	-	1	-	0.11
Walleye	25	-	0.06	-
Sauger	1	-	<0.01	-
Freshwater drum	2,825	-	6.22	-
Total	45,444	951	100.00	100.00

Table 24. Amphibians and Reptiles of the East Osage River Basin. Scientific name Missouri County* **Common name** B, H, Ca, Mi, P, Co, O, Hellbender Cryptobranchus alleganiensis Ma, L Ringed salamander Ambystoma annulatum All **Spotted salamander** Ambystoma maculatum All Marbled salamander L, O, Ma, P, Mi Ambystoma opacum **Smallmouth salamander** Ambystoma texanum O, Co Eastern tiger salamander Ambystoma tigrinum tigrinum All **Central newt** Notophthalmus viridescens louisianensis All Longrail salamander Eurycea longicauda All Cave salamander Eurycea lucifuga All **Graybelly salamander** Eurycea multiplicata griseogaster Pa, La Four-toed salamander Hemidactylium scutatum Ca, Mi, L, P, Ma Slimy salamander Plethodon glutinosus glutinosus All Southern redback Plethodon serratus All salamander B, H, Mo, Ca, L, P, Mi, Grotto salamander Typhlotriton spelaeus Ma Mudpuppy Necturus maculosus All Scaphiopus bombifrons Plains spadefoot Co, O

Eastern american toad	Bufo americanus	All
Great plains toad	Bufo cognatus	Co, O
Woodhouse's toad	Bufo woodhousei	All
Blanchard's cricket frog	Acris crepitans blanchardi	All
Green treefrog	Hyla cinerea	Ca, L, Mi
Northern spring peeper	Hyla crucifer crucifer	All
Gray treefrog	Hyla chrysoscelis	All
Western chorus frog	Pseudacris triseriata	All
Eastern narrowmouth toad	Gastrophryne carolinensis	All
Great plains narrowmouth toad	Gastrophryne olivacea	O, Co
Northern crawfish frog	Rana areolata circulosa	Mi, Mo, Co
Plains leopard frog	Rana blairi	Co, O
Bullfrog	Rana catesbeiana	All
Green frog	Rana clamitans	All
Pickerel frog	Rana palustris	All
Common name	Scientific name	Missouri County*
Southern leopard frog	Rana sphenocephala	All
Wood frog	Rana sylvatica	Os
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Common snapping turtle	Chelydra serpentina serpentina	All
Stinkpot	Sternotherus odoratus	All
Western painted turtle	Chrysemys picta bellii	All
Map turtle	Graptemys geographica	All
Mississippi map turtle	Graptemys kohnii	All
False map turtle	Graptemys pseudogeographica pseudogeographica	All
Missouri river cooter	Pseudemys concinna metteri	All
Three-toed box turtle	Terrapene carolina triunguis	All
Ornate box turtle	Terrapene ornata ornata	All
Red-eared slider	Trachemys scripta elegans	All
Midland smooth softshell	Trionyx muticus vuticus	All
Eastern spiny softshell	Trionyx spinifer spinifer	All
Northern fence lizard	Sceloporus undulatus hyacinthinus	All
Southern coal skink	Eumeces anthracinus pluvialis	All
Five-lined skink	Eumeces fasciatus	All
Broadhead skink	Eumeces laticeps	All
Ground skink	Scincella lateralis	All
Six-lined racerunner	Cnemidophorus sexlineatus	All

Western slender glass lizard	Ophisaurus attenuatus attenuatus	All
Western worm snake	Carphophis amoenus vermis	All
Northern scarlet snake	Cemophora coccinea copei	Ca, Mi, Ma, Pu
Eastern yellowbelly racer	Coluber constrictor flaviventris	All
Prairie ringneck snake	Diadophis punctatus arnyi	All
Great plains rat snake	Elaphe guttata emoryi	All
Black rat snake	Elaphe obsoleta obsoleta	All
Eastern hognose snake	Heterodon platyrhinos	All
Prairie kingsnake	Lampropeltis calligaster calligaster	All
Speckled kingsnake	Lampropeltis getulus holbrooki	All
Common name	Scientific name	Missouri County*
Red milk snake	Lampropeltis triangulum syspila	All
Eastern Coachwhip	Masticophis fagellum flagellum	All
Northern water snake	Nerodia sipedon	All
Rough green snake	Opheodrys aestivus	All
Bullsnake	Pituophis melanoleucus sayi	All
Midland brown snake	Storeria dekayi wrightorum	All
Northern redbelly snake	Storeria occipitamaculata occipitomaculata	All

Flathead snake	Tantilla gracilis	All
Western ribbon snake	Thamnophis proximus proximus	All
Eastern garter snake	Thamnophis sirtalis sirtalis	All
Central lined snake	Tropidoclonion lineatum annectens	Ma, Mi, Ca, Mo, Co
Rough earth snake	Virginia striatula	All
Osage copperhead	Agkistrodon contortrix phaeogaster	All
Western cottonmouth	Agkistrodon piscivorus leucostoma	Hi, La, Pu, Ma, Mi, Ca
Timber rattlesnake	Crotalus horridus	All

Note*: B-Benton, H-Hickory, Mo-Morgan, C-Camden, L-Laclede, P-Pulaski, Mi-Miller, Ma-Maries, C-Cole, O-Osage

Table 25. Mussels of the East Osage River Basin.			
Scientific Name			
Actinonaias ligamentina carinata			
Amblema plicata			
Anodonta imbecilis			
Anodonta suborbiculata			
Anodonta grandis grandis			
Arcidens confragosus			
Corbicula fulminea			
Cumberlandia monodonta			
Cyclonaias tuberculata			
Ellipsaria lineolata			
Elliptio crassidens crassidens			
Elliptio dilatata			
Fusconaia			
Fusconaia flava			
Lampsilis teres anodotoides			

Fat mucket	Lampsilis radiata luteola
Common Name	Scientific Name
Pink mucket	Lampsilis orbiculata
Pocketbook	Lampsilis ventricosa
Britt's mussel	Lampsilis reeviana brittsi
White heel-splitter	Lasmigona complanata
Fluted shell	Lasmigona costata
Scale shell	Leptodea leptodon
Fragile paper shell	Leptodea fragilia
Black sand shell	Ligumia recta
Washboard	Megalonaias nervosa
Three-honed warty-back	Obliquaria reflexa
Hickory-nut	Obovaria olivaria
Round pig-toe	Pleurobema sintoxia
Pink heel-splitter	Potamilus alatus
Pink paper shell	Potamilus ohioensis
Monkey-face	Quadrula metanevra

Pimple-back	Quadrula pustulosa
Maple leaf	Quadrula quadrula
Squaw foot	Strophitus undulatus undulatus
Liliput shell	Toxolasma parvus
Pistol-grip	Tritogonia verrucosa
Fawn's foot	Truncilla donaciformis
Deer-toe	Truncilla truncata
Pond-horn	Uniomerus tetralasmus
Ellipse	Venustaconcha ellipsiformis ellipsiformis

Table 26. Species of Conservation Concern found in the East Osage River Basin and conservation status and rank.

Common Name	Scientific Name	Federal Status	State Status	State Rank	Global Rank
	PLAN'	<u>TS</u>			
Shaggy moss	Rhytidiadelphus triquetrus				G5
Tussock sedge	Carex stricta				G5
Hairy-fruited sedge	Carex trichocarpa			S1	G4
Brown bog sedge	Carex buxbaumii			S2	G5
Smooth sheath sedge	Carex laevivaginata			S3	G5
Type of sedge	Carex fissa var. fissa			S1	G3G4
Broadwing sedge	Carex alata			S2S3	G4
Sharp-scaled manna grass	Glyceria acutiflora			S3	G5
Bald grass	Sporobolus ozarkanus			S4	
Type of liverwort	Preissia quadrata				G5
Waterwort	Elatine triandra				G5
Buffalo clover	Trifolium reflexum			S3S4	G5

Running buffalo clover	Trifolium stoloniferum	E	E	S1	G3
Heart-leaved plantain	Plantago cordata			S3S4	G4
Yellow-flowered leafcup	Smallanthus uvedalius			S4	G4G5
Royal catchfly	Silene regia			S3	G3
Butternut	Juglans cinerea			S2	G3G4
Type of wild hyacinth	Camassia angusta			S3	G5
Mead's Milkweed	Asclepias meadii	Т	E	S2	G2
Yellow-flowered horse gentian	Triosteum angustifolium var eamesii			S1	G5
Pale avens	Geum virginianum			S1	G5
Shining ladies' tresses	Spiranthes lucida			S3	G5
Northern rein orchid	Platanthera flava var herbiola			S2	G4
Tradescant aster	Aster dumosus var strictior			S2	G5
Queen of the prairie	Filipendula rubra			S2	G4G5
Wild sweet William	Phlox maculata ssp pyramidalis			S2	G5

	INVERTEB	RATES			
Hickorynut	Obovaria olivaria			S2S3	G4
Black sandshell	Ligumia recta			S1S2	G5
Pink mucket	Lampsilis abrupta	E	E	S2	G2
Spectaclecase	Cumberlandia monodanta			S3	G2G3
Elephant-ear	Elliptio crassidens		E	S1	G5
Rock-pocketbook	Arcidens confragosus			S3	G4
Giant floater	Pyganodon grandis corpulenta			S3S4	G5
Prairie mole cricket	Gryllotalpa major			S3	G3
Type of winter stonefly	Allocapnia pygmaea			S3	G5
Gray petaltail	Tachopteryx thoreyi				G4
Regal fritillary	Speyeria idalia			S3	G3
	FISH	I		-	
Lake sturgeon	Acipenser fulvescens		E	S1	G3
Blacknose shiner	Notropis heterolepis			S2	G5

Notropis buchanani			S2	G5
Hybognathus argyritis			S2	G5
Polyodon spathula			S3	G4
Esox lucius			S4	G5
Alosa alabamae	С		S2	G3
Hiodon tergisus			S2	G5
Cycleptus elongatus			S3	G3
Carpiodes velifer			S2	G4G5
Typhlichthys subterraneus			S1S2	G3
Fundulus sciadicus			S3	G3
Etheostoma microperca			S2	G5
Etheostoma nianguae	Т	E	S2	G2
Percina cymatotaenia			S2	G2
<u>AMPHIB</u>	<u>IANS</u>			
Hyla cinerea			S3S4	G5
	Hybognathus argyritis Polyodon spathula Esox lucius Alosa alabamae Hiodon tergisus Cycleptus elongatus Carpiodes velifer Typhlichthys subterraneus Fundulus sciadicus Etheostoma microperca Etheostoma nianguae Percina cymatotaenia	Hybognathus argyritis Polyodon spathula Esox lucius Alosa alabamae C Hiodon tergisus Cycleptus elongatus Carpiodes velifer Typhlichthys subterraneus Fundulus sciadicus Etheostoma microperca Etheostoma nianguae T Percina cymatotaenia	Hybognathus argyritis Polyodon spathula Esox lucius Alosa alabamae C Hiodon tergisus Cycleptus elongatus Carpiodes velifer Typhlichthys subterraneus Fundulus sciadicus Etheostoma microperca Etheostoma nianguae T E Percina cymatotaenia	Hybognathus argyritis Polyodon spathula Esox lucius Alosa alabamae C S2 Hiodon tergisus S3 Carpiodes velifer S2 Typhlichthys subterraneus Fundulus sciadicus Etheostoma microperca Percina cymatotaenia S3 S2 S4 S4 S4 S2 S2 S2 S2 S2 S3 S3 S4 S5 S2 S2 S2 S3 S4 S5 S5 S5 S5 S5 S5 S5 S5 S5

Ringed salamander	Ambystoma annulatum			S3	G4
Four-toed salamander	Hemidactylium scutatum			S4	G5
Grotto salamander	Typhlotriton spelaeus			S3	G4
	REPTII	LES	·	,	
Eastern collared lizard	Crotaphytus collaris collaris			S4	G5
Northern scarlet snake	Cemophora coccinea copei			S2S3	G5T5
	BIRD	<u>os</u>	· ·	,	
Bald eagle	Haliaeetus leucocephalus	Т	E	S2	G4
Sharp-shinned hawk	Accipiter striatus			S2	G5
Red-shouldered hawk	Buteo lineatus			S3	G5
Cooper's hawk	Accipiter cooperi			S3	G5
Henslow's sparrow	Ammodramus henslowii			S2	G4
Greater prairie chicken	Tympanuchus cupido		E	S1	G4
Upland sandpiper	Bartramia longicauda			S3	G5

Great blue heron	Ardea herodias			S5	G5							
MAMMALS												
Gray bat	Myotis grisescens	E	E	S3	G3							
Indiana bat	Myotis sodalis	E	E	S1	G2							
Black-tailed jackrabbit	Lepus californicus			S1	G5							
Eastern woodrat	Neotoma floridana			S3S4	G5							
Cotton mouse	Peromyscus gossypinus			S2	G5							

E=Endangered

T=Threatened

C=Candidate for listing

S1=Critically imperiled in Missouri because of exterme rarity or because some factor(s) make it especially vulnerable to extirpation

S2=Imperiled in Missouri because of rarity or because some factor(s) make it very vulnerable to extirpation

S3=Rare or uncommon in Missouri

S4=Widespread, abundant, and apparently secure in Missouri, but of long-term concern

S5=Demonstrably widespread, abundant, and secure in Missouri, and essentially ineradicable under present conditions

G1-G5=Relative endangerment for the species worldwide. Numerical categories are similar to S1-S5 above.

Table 27. Species of Conservation Concern in East Osage River Basin by subbasin (MDC Natural History database).														
Common Name (if available)	Lower Osage R.	Lower Maries R.	Upper Maries R.	Little Maries R.	Tavern Cr.	Wet Glaize Cr.	Dry Auglaize Cr.	Deer Cr.	Turkey Cr.	Cole Camp Cr.	Upper LOZ Hills	Gravois Arm	Lower LOZ Hills	Miller Co Osg R Hills
						PLA	NTS							
Heart-leaved plaintain	X										x			X
Yellow-flowered leaf	X													
Purple loosestrife				x										
Tussock sedge					X									
Hairy-fruited sedge					x									
Brown bog sedge													X	
Smooth sheath sedge					X						x	X	x	
Bald grass					X									
(Carex fissa)						X								
(Panicum acuminatum)						x					678		X	

Royal catchfly			x	X					X	X
Butternut									X	
(Preissia quadrata)				x						
Waterwort				x						
Sharp-scaled manna grass				x						
Broadwing sedge				x						
(Camassia angusta)						X				
Mead's milkweed						X				
Yellow-flowered horse gentian						x				
Pale avens						X				
Shining ladies' tresses							X	X	X	
Northern rein orchid								X		
Shaggy moss								x		
Tradescant aster							x			
Buffalo clover									X	

Running buffalo clover											x			
Queen of the prairie											x			
Wild sweet william											x			
INVERTEBRATES														
Hickorynut x x														
Black sandshell	Х	X			X									X
Pink mucket	X													X
Spectaclecase	X													X
Elephant ear	Х													X
Rock pocketbook	X													X
Giant floater	X													X
Prairie mole cricket										X				
(Allocapnia pygmaea)														X
Gray petaltail													x	
Regal fritillary										X				
						FIS	<u>H</u>							

Alabama shad	X											
Northern pike	X		X									x
Ghost shiner	X	X										x
Plains topminnow	X	x	x	x	x				X	X		X
Blacknose shiner			x	x			X					
Niangua darter					X							
Southern cavefish						x						
Mooneye												X
Paddlefish												x
Highfin carpsucker												X
Lake sturgeon												X
Blue sucker												X
Least darter								x	x		x	
	,					AMPHI	BIANS				,	
Green treefrog						X						
Ringed salamander							X					
Four-toed salamander									,	X		
										705		<u> </u>

Grotto salamander													x	
						REPT	<u>ILES</u>							
Eastern collared lizard	X				X									
Northern scarlet snake												X	X	X
<u>BIRDS</u>														
Great blue heron	X				X	x		X		X	x			X
Bald eagle	X							x			X		X	X
Cooper's hawk		x			x						X			
Sharp-shinned hawk					X									
Henslow's sparrow					X					X				
Greater prairie chicken										x				
Upland sandpiper										x				
Red-shouldered hawk											X		X	
	<u>MAMMALS</u>													
Gray bat	X					X		X		X	X	X	X	X
Indiana bat						X					71			

Black-tailed jackrabbit					X				
Eastern woodrat							x	Х	
Cotton mouse						x			